Health Consultation

Follow-up Assessment of the Truck Repair Yard Portion of the Roderick Timber Property Aberdeen, Grays Harbor County, Washington

September 4, 2001
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Prepared by
The Washington State Department of Health
under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Foreword

The Washington State Department of Health (DOH) has prepared this health consultation under cooperative agreement with the Agency for Toxic Substances Disease Registry (ATSDR), an agency of the U.S. Public Health Service. The goal of the DOH and ATSDR is to identify and mitigate adverse human health effects resulting from exposure to hazardous substances in the environment. This report was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this Health Consultation is to conduct a follow-up of the previous health consultation, Truck Repair Yard Portion of the Roderick Timber Company, written on July 1, 1999. The general purpose of all health consultations is to identify and prevent harmful human health effects resulting form exposure to hazardous substances in the environment. The health consultation allows DOH to respond quickly to a request from concerned residents for health information on hazardous substances. It provides advise on specific public health issues. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health.

For additional information or questions regarding DOH, ATSDR or the contents of this health consultation, please call the health advisor who prepared this document:

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Glossary

Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Aquifer	An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
Carcinogen	Any substance that can cause or contribute to the production of cancer.
Chronic	A long period of time. A chronic exposure is one which lasts for a year or longer.
Comparison value	A concentration of a chemical in soil, air or water that, if exceeded, requires further evaluation as a contaminant of potential health concern. The terms comparison value and screening level are often used synonymously.
Contaminant	Any chemical that exists in the environment or living organisms that is not normally found there.
Dose	A dose is the amount of a substance that gets into the body through ingestion, skin absorption or inhalation. It is calculated per kilogram of body weight per day.
Exposure	Contact with a chemical by swallowing, by breathing, or by direct contact (such as through the skin or eyes). Exposure may be short-term (acute) or long-term (chronic).
Groundwater	Water found underground that fills pores between materials such as sand, soil, or gravel. In aquifers, groundwater often occurs in quantities where it can be used for drinking water, irrigation, and other purposes.
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.

Indeterminate public health hazard	Sites for which no conclusions about public health hazard can be made because data are lacking.
Ingestion rate	The amount of an environmental medium which could be ingested typically on a daily basis. Units for IR are usually liter/day for water, and mg/day for soil.
Media	Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.
Minimal Risk Level (MRL)	An amount of chemical that gets into the body (i.e. dose) below which health effects are not expected. MRLs are derived by ATSDR for acute, intermediate, and chronic duration exposures by the inhalation and oral routes.
Model Toxics Control Act (MTCA)	The hazardous waste cleanup law for Washington State.
Monitoring wells	Special wells drilled at locations on or off a hazardous waste site so water can be sampled at selected depths and studied to determine the movement of groundwater and the amount, distribution, and type of contaminant.
No apparent public health hazard	Sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.
No public health hazard	Sites for which data indicate no current or past exposure or no potential for exposure and therefore no health hazard.
Oral Reference Dose (RfD)	An amount of chemical ingested into the body (i.e. dose) below which health effects are not expected. RfDs are published by EPA.
Organic	Compounds composed of carbon, including materials such as solvents, oils, and pesticides which are not easily dissolved in water.
Parts per billion (ppb)/Parts per million (ppm)	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition size swimming pool, the water will contain about 1 ppb of TCE.

Risk	The probability that something will cause injury, linked with the potential severity of that injury. Risk is usually indicated by how many extra cancers may appear in a group of people who are exposed to a particular substance at a given concentration, in a particular pathway, and for a specified period of time. For example, a 1%, or 1 in 100 risk indicates that for 100 people who are exposed, 1 person may experience cancer as a result of the exposure.
Route of exposure	The way in which a person may contact a chemical substance that includes ingestion, skin contact and breathing.
U.S. Environmental Protection Agency (EPA)	Established in 1970 to bring together parts of various government agencies involved with the control of pollution.
Volatile organic compound (VOC)	An organic (carbon-containing) compound that evaporates (volatilizes) easily at room temperature. A significant number of the VOCs are commonly used as solvents.

Background and Statement of Issues

A previous health consultation, released in July of 1999, evaluated the potential human health risks associated with hazardous materials in the truck repair yard portion of the Roderick Timber Company.[1] The purpose of this consultation is to consider redistribution of potentially contaminated soil and indoor air within an area frequently occupied by classroom students. For general background of the site, refer to the previous consultation.[1]

The Roderick Timber site is located approximately 2 miles southeast of Aberdeen, Washington (Figure 1). In January of 2001, the City of Aberdeen received a grant from the Environmental Protection Agency (EPA) for a Brownfields pilot project to investigate the potential for redevelopment of this property and address issues related to environmental contamination.[2] The project addresses two areas: The *truck repair yard* and the *landfill.* This health consultation is confined to the truck repair yard (Figure 2), with the addition of any part of the landfill which may extend beneath this area.

The truck repair yard, sometimes referred to as the *fenced area*, is a 3.2 acre lot bordered to the north by a residential area known as Junction City (Figure 2). The truck repair yard is bordered on the south and east by the landfill, also known as the Dredge Fill Area, or part of the Snell Tract. However, some documents show that the truck repair yard is entirely over the landfill (Figure 3), and shallow monitoring wells have shown elevated methane gas in several areas of the truck repair yard (Figure 4).[3]

The Roderick Timber Company used this facility as a truck repair shop from 1978 through 1987. The repair yard consisted of a main shop building, a storage shed, several underground storage tanks (USTs) for diesel and gasoline, and a waste oil tank to the north of the main shop (Figure 5). The repair yard has a history of contaminated petroleum products, solvents, and heavy metals. A steam-cleaning operation on a concrete slab in the northeast corner of the truck repair yard was apparently equipped with a sump, but with no oil/water separator. Therefore, it is believed that untreated wastewater ran into a swale north of the truck yard property and south of a ditch running along Stanley Street. There is no environmental data to indicate that the ditch along Stanley Street is contaminated with untreated waste water, however, this ditch is often caked with iron bacteria, typical for landfill leachate or runoff.

Iron Bacteria

Iron bacteria are a natural part of the environment in most parts of the world. These microorganisms combine dissolved iron or manganese with oxygen and use it to form rust-colored deposits. Effects of iron bacteria are seen in surface waters as brown slimy masses on stream bottoms and lake shores or as an oily sheen upon the water. Iron bacteria generally doesn't cause health problems in surface water or ground water, but can cause odors, corrode pipes, and build up and obstruct well screen intakes.

Site topography is relatively flat but slopes somewhat to the northwest. There are two groundwater aquifers beneath the site that also flow northwest. The shallow perched aquifer ranges from 8-10 feet below ground surface, and the lower main aquifer is approximately 130 feet deep. All residents in Junction City are provided drinking water by the City of Aberdeen public water system, located approximately 20 miles north of town.

In July of 1987, a spill of a strong chlorine-based solvent occurred during salvaging of a solvent tank in the northeast area of the truck repair yard (Figure 5). This area was excavated, stockpiled, and sampled, and found to be contaminated with unspecified phenols. Stockpiled soils and 1,700 gallons of liquid from six fuel USTs were removed and transported offsite.[2] Soil sampling was recently conducted in the northeast area of the truck repair yard, as was sediment sampling just north of this area in a swale (Figure 6).

The truck repair yard is currently used by the Grays Harbor Historical Seaport Authority (GHHSA) for an alternative highschool educational program. GHHSA uses the shop building for its boat building and repair training programs. The oil-changing pit still exists inside the building and is now used for working on boats with keels. The other building within the truck yard is a steel storage shed located in the southwest corner of the yard. GHHSA has covered most of the fenced area with gravel.[2]

Junction City residents and Ecology are concerned about potential exposure to toxic substances located in the former truck repair yard specifically during excavating and re-grading of the facility. Although soil within the fenced area had been characterized, the excavation and back-filling of a trench on the south side of the shop building, another trench between the shop building and the main gate, and installation of a septic tank and drain field has redistributed soil in these areas (Figure 5). Anecdotal evidence indicates that students have participated in filling in one or more of the ditches, previously excavated by a backhoe. Also, several post holes were dug in the southeast area of the truck repair yard for installation of poles and mast rigging for the students to simulate working aboard ship. In addition to concerns associated with exposure of students to contaminants in soil within the fenced area, residents could be exposed to soil contaminants in the swale located between the truck yard fence and Junction City. Children from the Junction City residential area have access to this swale and could potentially be exposed to contaminated soil, sediment, and/or surface water.

Soil within the truck repair yard is partially characterized. Ecology conducted soil sampling in January of 2001 of the southeast area, and analyzed for metals and semi-volatile organic compounds (SVOCs). Concentrations of metals and SVOCs did not exceed ATSDR comparison values. Additional soil, sediment, surface water, and groundwater samples were taken in January and March of 2001 from other areas in the truck repair yard as well as the landfill.[4,5,6] There were numerous detections of metals and hydrocarbons within the fenced area, however, none exceeded comparison values.

Additional soil and sediment sampling was conducted in June of 2001 of the northeast area, near the former Waste Oil Tank, the Oil-Stained Area, the former Steam Cleaning Pad, and within the top three inches of soil (under the gravel cap) where excavation and backfilling has occurred (Figure 6). Proposed soil and sediment analysis will include, but not be limited to, SVOCs and chromium. DOH is currently awaiting results from the lab.

Discussion

Site environmental sampling data were screened using federal (ATSDR and EPA), and state (MTCA method B) screening comparison values. Contaminant concentrations below comparison values are unlikely to pose a health threat, and were not further evaluated in this health consultation. Contaminant concentrations exceeding comparison values do not necessarily pose a health threat, but were evaluated further to determine if levels could result in adverse human health effects.

The previous health consultation dated July 1, 1999, considered the truck repair yard as a restricted area (surrounded by a chain link fence), not accessible to area children. However, this area is currently being used by high school students for the GHHSA boat building program. There are four classes of five to seven students each who spend from 2 to 3 hours per day at the site.[2] The facility has five full-time employees who work 40 or more hours per week. In addition, GHHSA uses the services of approximately 10 volunteers, who spend approximately 20 hours per week at the site. Therefore, a typical worst-case scenario for exposure duration for students would be approximately three hours per day.

Studies indicate that shallow groundwater under the truck yard is located at 8-10 feet below ground surface, and is contaminated with TPH. All residences in the area are supplied with drinking water by the City of Aberdeen which draws from the headworks of the Wishkah River 20 miles north of Aberdeen, therefore, exposure via drinking water is not of concern.

Soil Contamination

The most viable environmental media considered for pathway analysis was soil within the fenced area and sediment and surface water along the swale between Junction City and the north side of the fenced area. Soil within the truck repair yard is partially characterized with three sets of data: The 1998/1999 data by Olympus, the January 2001 data from the southeast area by Ecology, and the April 2001 data from the truck repair yard (and the landfill) performed by Foss Environmental.

The April 2001 sampling by Foss Environmental indicated numerous detections of metals and hydrocarbons in soil within the fenced area and sediment and surface water along Stanley Street. The maximum concentration of diesel (4400 ppm) was found at 5 feet below ground surface approximately half way between the main shop building and the shed.[6] No other samples exceeded health comparison values. In addition, the study by Ecology in the southeast area indicated that metals and SVOCs in surface and near-surface soil did not exceed ATSDR health comparison values.

The study by Olympus in 1998/1999 determined that both surficial and subsurface soils in the truck repair yard showed evidence of TPH contamination in excess of MTCA Level A standards.[2] The maximum concentration of *petroleum hydrocarbons* in the truck yard soil was 12,740 ppm and the average concentration was 3110 ppm. The maximum concentration of *fuel hydrocarbons* in soil was 15,200 ppm, and the average concentration was 555 ppm. The addition of fuel hydrocarbons with petroleum hydrocarbons comes to 3,665 ppm, average total petroleum hydrocarbons (TPH) within the truck repair yard. The maximum concentration of petroleum hydrocarbons in the swale sediments in 1998/1999 was 808 ppm, up from 160 ppm in 1988. PAHs were found in the swale north of the Truck yard in 1988, but were not tested for in 1998 or 1999.[2] TPH or polycyclic aromatic hydrocarbon (PAH) contamination in the swale may not necessarily be coming from the truck yard as there have been old vehicles from Junction City stored on the north side of the swale.

Since health comparison values for petroleum hydrocarbons and fuel hydrocarbons are not available, a screening value for pyrene of 2,000 ppm was used for comparison. Pyrene is considered as a surrogate for the entire group of aromatic petroleum hydrocarbons, and is the most toxic non-carcinogenic PAH. Since the pyrene screening value was exceeded, a further evaluation was conducted to determine whether 3,665 ppm in soil is a level which could result in adverse human health effects.

As a health protective measure, it was assumed that young children would frequent the truck repair yard 365 days per year, for an exposure frequency (EF) of 365. The ingested dose for children exposed to 3,665 ppm TPH in soil over a period of five years was estimated to be 0.0244 mg/kg/day (dose calculations are located in the Appendix), which is less than EPAs chronic oral reference dose (RfD) for pyrene of 0.03 mg/kg/day. This comparison indicates that adverse health effects are not expected to occur for persons exposed to contaminants in these areas.

The remaining data gaps where soil has been excavated and backfilled are between the main gate and the shop building, along the south side of the shop building, and on the north side of the shop building where a septic tank and drain field was installed (Figure 5). There has been one test pit drilled near the south side of the shop building, however data gaps remain as the trench along the building may have been as long as the shop building. Without characterization of soils that have

been excavated and backfilled, exposure to contaminated soil by high school students is possible.

There is conflicting information regarding how much of the truck repair yard overlies the landfill. Some evidence indicates that only the southeast corner of the truck repair yard is over the landfill, while other evidence shows the entire fenced area over the landfill, of which most was used for burial of solid waste (Figure 3). Since 50 acres of the landfill around the truck repair yard consisted of dredge spoils, wood waste, and municipal solid waste, another potential pathway is the accumulation of landfill gas, such as methane, inside the buildings. When the upward movement of methane is inhibited, the gas tends to migrate horizontally to other areas within the landfill *or to areas extending outside the landfill* where it can resume its upward path. In addition, soil vapor exploration probes showed methane greater than 15,800 ppm just north of the main shop building, along the east side and southeast corner of the truck repair yard, and 14,200 ppm near the storage shed (Figure 4).

Landfill Gas

In order to discuss air pathways of working in a building over an existing landfill, the characteristics and hazards of landfill gas must be considered. Landfill gas is composed of a mixture of different gases. By volume, landfill gas is composed of about 50% carbon dioxide and 50% methane.[7] Landfill gas also contains a smaller percentage of nitrogen, oxygen, ammonia, sulfides, hydrogen, carbon monoxide, and nonmethane organic compounds (NMOCs), such as trichloroethylene, benzene, and vinyl chloride. Landfill gas is produced by three processes - bacterial decomposition, volatilization, and chemical reactions.

The rate and volume of landfill gas produced at a specific site depend on the composition and age of the refuse, and the presence of oxygen in the landfill, moisture content, and temperature.

Landfill gas expands to fill whatever space is available. Once gas is produced in a landfill, it begins to move, or "migrate." The movement of landfill gas creates health and safety concerns when the gas enters buildings and other confined areas such as utility corridors. Methane is the constituent of landfill gas that is likely to pose the greatest explosion hazard. Since methane is lighter than air, it has a natural tendency to move upward, and eventually out of the landfill surface. Densely compacted waste or a landfill cap can inhibit upward movement of landfill gas. When upward movement is inhibited, the gas tends to migrate horizontally to other areas within the landfill or to areas outside the landfill where it can resume its upward path. Other gases, such as carbon dioxide, are denser than air and can collect in subsurface areas, such as utility corridors.

As indicated above, the disposal methods and landfill construction can influence the movement

of landfill gases. The changes in disposal methods and waste materials over the active disposal period of a landfill also affect the composition and generation of landfill gases. Landfills that contain significant amounts of construction debris such as gypsum boards tend to generate more hydrogen sulfide gases than landfills with only vegetative (tree stumps and yard trimmings) wastes. Landfills that disposed of liquid chemical wastes in separate areas from sanitary wastes tend to produce higher concentrations of NMOCs.

Age and disposal history result in significant differences in landfill gas generation and movement within the landfill. Sanitary and vegetative wastes disposed in the oldest portion of a landfill may be past peak landfill gas production while wastes disposed immediately before closure may not have reached peak production rates. It appears that approximately 50 acres of the Snell Tract, including the truck repair yard has been the site of dredge spoil, wood waste, and municipal solid waste land-filling. Assuming it has been 25 years since the landfill received any refuse, current landfill gas production would be approximately a third of its peak production (which occurred 20 years ago) and continues to decline over time.

The concentration and movement of landfill gas can change rapidly (in a matter of hours) in response to changes in atmospheric and subsurface conditions. Higher atmospheric pressures can inhibit upward movement of landfill gases. Rainfall can saturate pore spaces in surface soils thereby reducing vertical movement and increasing horizontal movement. Rising flood waters in the Elliott Slough or the Chehalis River may cause temporary rise in water table levels, displacing landfill gases upward and outward. Infrequent monitoring of landfill gases may miss such rapid changes or lead to misinterpretations of site specific conditions.

The concentration level at which gas has the potential to explode is called the explosive limit. The potential for a gas to explode is determined by the lower explosive limit (LEL) and upper explosive limit (UEL). The LEL and UEL are measures of the percent of a gas in the air by volume. At concentrations below its LEL (5% methane by volume) and above its UEL (15% methane by volume), methane is not explosive. However, an explosion hazard may exist if the gas is present in the air between the LEL and UEL and an ignition source is present.

Landfill gas may be a hazard at this site. Although there is conflicting information as to how much of the truck repair yard is over the landfill, even if a small percentage is over the landfill, landfill gas often migrates horizontally before coming up to the surface, and past soil gas probes indicated elevated methane levels in several areas of the truck repair yard.

Indoor Air

The landfill, contaminated soil, and groundwater are potential sources of indoor air contaminants at the truck repair yard. Soil and shallow groundwater contain elevated concentrations of

petroleum and chlorinated organic compounds. Some of these contaminants can evaporate and migrate through the soil column into indoor air. The types of contaminants associated with the landfill and how they migrate are discussed in the previous section of the health consultation. No indoor air data (such as methane and VOCs) are available to assess whether students, faculty, or volunteers at the facility are being exposed to harmful levels of landfill, soil, or groundwater contaminants through the inhalation pathway.

Exposure Pathways and Children

ATSDR's Child Health Initiative recognizes the unique vulnerabilities of infants and children deserve special emphasis regarding exposures to environmental contaminants. Infants, young children, and the unborn may be at greater risk than adults from exposure to particular contaminants. Exposure during key periods of growth and development may lead to malformation of organs (teratogenesis), disruption of function, and even premature death. In certain instances, maternal exposure, via the placenta, could adversely effect the unborn child.

After birth, children may receive greater exposures to environmental contaminants than adults. Children are often more likely to be exposed to contaminants from playing outdoors, ingesting food that has come into contact with hazardous substances, or breathing soil and dust. Pound for pound body weight, children drink more water, eat more food, and breathe more air than adults. For example, in the United States, children in the first 6 months of life drink 7 times as much water per pound as the average adult. The implication for environmental health is that, by virtue of children's lower body weight, given the same exposures, they can receive significantly higher relative contaminant doses than adults.

The estimated exposure dose of TPH at the site does not exceed health comparison values. This estimated dose assumed that a young child could be exposed to maximum levels of contaminants found on or off-site. This assumption will be protective of both children playing outside the fence and high school students within the fenced area. However, the inadequate characterization of soil, particularly in areas that have been excavated, suggests that more sampling is necessary in order to better estimate exposure to both children and adults at the site.

Conclusions

- The previous health consultation titled "Truck Repair Yard Portion of the Roderick Timber Property," dated July 1999, established the truck repair yard as a restricted area

inaccessible to children. However, this area is being used as an alternative high school where students can contact contaminants in soil. In addition, soil sampling results in areas that have since been excavated are suspect. Therefore, the truck repair yard currently poses an *indeterminate public health hazard.* This hazard status remains until the site is re-characterized in all areas where soil redistribution has occurred, in addition to determining the results of recent soil and sediment sampling in the northeast area.

- Since groundwater and soil beneath the truck repair yard is contaminated with TPH and solvents, it is possible that TPH and VOCs could move from groundwater and soil into the indoor air of the GHHSA buildings. Indoor air monitoring inside the buildings has not been conducted, therefore indoor air continues to pose an *indeterminate public health hazard.*

- Since some or all of the truck repair yard has been built over the landfill, there remains the possibility of methane gas accumulating inside the buildings and creating a potential explosion hazard, therefore the possibility of indoor methane poses an *indeterminate public health hazard.*

- Based upon environmental monitoring of the ditch along Stanley Street, concentrations of hazardous materials in sediment and surface water appear to be below levels of health concern. This area poses *no apparent public health hazard.*

Recommendations/Public Health Action Plan

- Surface soil in areas of the truck yard that has been excavated and filled back in with the same soil should be re-sampled to ensure that contaminated soil has not been redistributed to the surface or near the surface. Surface soil samples should come from the top three (3) inches of the ground surface beneath the gravel cap.

- Engineering controls such as indoor explosive gas monitors should be installed and maintained in all buildings within the truck repair yard. If necessary, engineering controls and safety contingency actions should be implemented to prevent injuries and illness from landfill gases.

- The presence of high school students working at this facility is not recommended until

indoor air and surficial soils have been characterized and determined to be at levels below health concerns.

- The Department of Ecology should be notified prior to any future excavations or movement of soil within the fenced area. Disturbed soils should be resampled prior to using the facility for public school activities.

- High school students should not be allowed to participate in any soil excavation or backfilling activities, nor frequent any areas where soil has been disturbed due to potential TPH or VOC contamination.

- Soil and sediments (in the swale) near the Former Waste Oil Tank, Oil-Stained Area, and Steam Cleaning Pad should be characterized with respect to contamination that might be associated with past operations.

- There are no recommendations with respect to sediment and surface water in the ditch along Stanley Street.

Public Health Action Plan

Results of future environmental sampling should be provided to DOH for evaluation of potential health impacts.

Copies of this health consultation will be provided to Ecology, Grays Harbor County Health Department, the Grays Harbor Historical Seaport Authority, the Washington State Superintendent of Public Instruction, and accessible to citizens of the Junction City residential area.

insert Preparer of Report

References

1. Truck Repair Yard Portion of the Roderick Timber Property, S. Matthews, July 1, 1999.

2. Preliminary Analysis of Site Characterization Data and Risk Assessment, Brownfields Pilot Project, Environment International Ltd., January 2001.

3. Remedial Investigation/Feasibility Study, Roderick Timber Company Property, Grays Harbor County, Washington for Port of Grays Harbor, GeoEngineers, Inc., March 1989.

4. Memorandum to D. Reale, from J. Ross, Manchester Lab, Metals Quality, February 1, 2001.

5. Memorandum to D. Reale, from G. Perez, Manchester Lab, Semi-volatile Organics at Roderick Timber, February 9, 2001.

6. Results from Sampling conducted by Department of Ecology through Foss Environmental, Brownfields Pilot Project, April 2001.

7. Health Consultation for Everett Landfill, Snohomish County, Washington, S. Matthews, November 3, 2000

8. Sampling Report, Roderick Timber Company Property, Olympus Environmental, Inc., September 24, 1998.

9. Natural Background Soil Metals Concentrations in Washington State, Department of Ecology, October 1994.

10. Sampling Report from Olympus Environmental, Inc., A. Alderson, December 15, 1998.

Appendix

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Soil ingestion calculations:

$$ID = \frac{Cs \times IR \times CF \times EF \times ED}{BW \times AT}$$

		Residential
ID = ingested dose (mg/kg/day)		0.0244
CS = concentration in soil (mg/kg)		3665
IR = ingestion rate (mg/day)	Child	100
CF = conversion factor (kg/mg)		1.0E-06
EF = exposure frequency (day/years)		365
ED = exposure duration (years)	Child	5
BW = body weight (kg)	Child	15
AT = averaging time (days)	non-carc	1825
	carc	27375

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